129-1

[redacted]

INVOICE CHECK LIST

MKULTRA Subproject

At Date of Original Authorization	Period Covered	Time Extended To	Allotment Number	Amount of Obligation
22 Jan 1951	1 year		1121-[illegible]-52	23,025.33

Additional Authorizations	Period Covered	Time Extended To	Allotment Number	Amount of Obligation

Invoice Number	Date	Amount	Balance
#1	6 Jul 1951	23,025.33	0
REMARKS:			

[redacted]

129-2

[redacted]

Purpose: To support, in part, a study of the computer analysis of bioelectric response patterns (MKULTRA 129).

Initiated: June 1961

Contractor: [redacted] as a grantee of [redacted]

Cost: $2,505.33

Status: Commencing.

[redacted]

#4

129-2A

129

February 5, 1963

[redacted]

Dear [redacted]

On July 6, 1961, a grant was made by the [redacted] in the amount of $2,505.33, to supplement work in progress at the [redacted] These funds were expended in payment for the following items:

2 power supplies, [redacted] Inc.	$1,000.00
1 dermohmmeter, Yellow Springs Instruments Co.	890.06
beam switching tubes & breadboards, Burroughs Corp.	198.99
wire and connectors, Graybar Electric Co.	21.09
1 chair for experimental subject, Hecht Co.	89.95
1 parts cabinet, Ginn's	54.77
1 pulse transformer, Freed Transformer Co.	19.10
diodes, resistors, Electronic Wholesalers, Inc.	94.62
capacitors, diodes, Capitol Radio Wholesalers, Inc.	77.55
tubing, resistors, Certified Electronics, Inc.	6.82
IBM Part No. 1010671	7.30
dust control for magnetic tape unit	45.00
Total	$2,505.33

I have [illegible] submitted expenditures.

[redacted]

Chief

TSS/Technical Div[illegible]n

Date: 2/25/63

129-2B

[redacted] - 2 - February 5, 1963

[redacted]

A Look into the Future: Computer Techniques for Psychophysiology.

[redacted]

Participants:

[redacted] What is the future of data-reduction instrumentation in the psychophysiology laboratory?

[redacted] The SETAR (Serial Event Timer and Recorder) in the automatic data processing of psychophysiologic information.

[redacted] The effect of electronic devices on research behavior.

[redacted] Analysis of physiologic response to film.

[redacted] Computer programs for the analysis and synthesis of psychophysiologic data.

[redacted] Analog-to-digital conversion and recording of ten simultaneous data channels in digital computer format directly from the human subject.

[redacted] Reduction of polarization effects in skin conductance measurement.

Since our research may be of interest to you, we would appreciate having such further support from you, as you deem appropriate.

Sincerely yours,

[redacted]

Your grant helped to support the following papers, symposia and publications:

PUBLICATIONS

[redacted] Recording physiological measurements for data processing. [redacted]

[redacted] An IBM 1620 program for a regression transformation of psychophysiologic data. [redacted]

[redacted] reparing psychophysiologic analog information for the digital computer. [redacted]

[redacted] Digital computer analysis of psychophysiologic information. [redacted]

[redacted] in psychophysiology. [redacted]

[redacted] A high-speed constant-illumination tachistoscope for automatic sequencing of n stimuli [redacted]

[redacted] A non-polarizing, high-accuracy skin-resistance transducer for digital conversion. [redacted]

PAPERS READ AT PROFESSIONAL MEETINGS

[redacted] The control of human behavior by scientific means. [redacted]

[redacted]

1293

[redacted]

November 17, 1961

Dear [redacted]

[redacted] letter explains the enclosure. After reading it, I would agree that it does "conform to the best current thinking on skin conductance."

This is my only copy. We'll send journal reprints when available. Meanwhile, this bit may help some of your people who are thinking along similar lines.

[redacted]

Enclosure [redacted]

File [redacted]

[redacted]

November 8, 1961

129-4

[redacted]

Enclosed is a copy of a paper we are submitting for journal publication.

This equipment was developed by us since a suitable instrument was not available commercially. It incorporates the characteristics which we find most desirable for our system, and conforms to the best current thinking on skin conductance.

Hope to see you soon.

Best wishes,

[redacted]

[redacted]

Enclosure

A Non-polarizing, High-accuracy Skin Conductance Transducer for Digital Conversion[1]

127-4A

by

[redacted]

PURPOSE

This instrument is arranged for analog-to-digital conversion and subsequent recording on magnetic tape, and was specifically designed for this application. However, it can be applied with a variety of readout devices.

The instrument described here incorporates several basic characteristics:

(1) overcomes the polarization effect at the electrodes by a continuous reversal of the direction of current flowing through the subject,[2]

(2) an absolute value circuit nullifies any effect which current reversal might have on the output,

(3) covers the total range of the subject's resistance from 0-400K as a single channel voltage output,

(4) a high resolution which permits discrimination of changes as small as one part in 2,000.

In practice, the resolving power of this instrument is limited by the readout device coupled to its output. In its present application

1. This study was supported by the [redacted]

2. The initial suggestion for nullifying polarization effects by means of current reversals [redacted]

this is one part in 2,048 of the resistance range covered, which represents the maximum capability of an eleven-bit binary analog-to-digital converter with a plus or minus 10 volts input.

PRINCIPLE OF OPERATION

This unit utilizes the constant current feedback circuit of an operational amplifier to determine the skin conductance of a subject. The I-R drop across a subject is calculated by a differential amplifier which algebraically adds the voltage at one side of the subject to the inverted voltage at the other side.

A multivibrator current-switching circuit is used to reverse the current flow through the subject, thus preventing electrode polarization. Due to the current reversal through the subject, an absolute value circuit is added to keep the output of the differential amplifier positive at all times.

The electrodes used with this instrument are two zinc-zinc sulfate electrodes, 2 cm. in diameter, and mounted in lucite cups, and are attached to the volar surface of the subject's left metacarpus and forearm.

The output voltage of the absolute value circuit, when divided into the constant subject current (50ua), equals the subject's conductance:

$$G = \frac{I}{E}$$

The subject current, which remains constant after being adjusted, is 50ua. This current results in an output voltage between 0 to 20 volts for resistance readings of less than 400,000 ohms.

Each amplifier has a shorting switch and balance circuit in its input. A front panel switch and meter are available to read the outputs of each

amplifier which can thereby be balanced individually without other test equipment.

Precision resistors (1%) of 100,000 ohms, 50,000 ohms, 25,000 ohms, 10,000 ohms, 5,000 ohms, and 2,500 ohms may be switched into the feedback circuit of the constant current amplifier when calibration is desired.

APPARATUS

Constant Current Amplifier. The constant current amplifier consists of a Philbrick K2-W operational amplifier, a Philbrick K2-P stabilizing amplifier, and associated feedback and input resistors. If it is not desirable to have a chopped DC current at 60 pulses per second through the Philbrick K2-P may be replaced with standard biasing resistors. Great care must then be exercised in balancing this circuit.

The input circuit voltage divider uses a 10,000 ohm potentiometer to set the current flow through a 270,000 ohm input resistor. If the current flow through this resistor is set at 40ua, then the feedback current flow through the 250,000 ohm feedback resistor, which connects to the summing point of the amplifier, will also be 40ua. This is due to the feedback characteristics of the operational amplifier. Forty microamperes flowing through a 250,000 ohm resistor will cause a ten volt potential to be present at the one megohm input resistor of the inverter portion of the differential amplifier. Ten volts dropped across a one megohm resistor produces a current flow of ten ua. The combination of the 40ua current and the ten ua current both flow through the subject. With the subject resistance at less than 400,000 ohms, the current flow through the subject is 50ua at all times. The input voltage to the second half of the differential amplifier is then 50(ua) times the subject resistance plus ten volts.

129-4D

Assume the subject resistance to be 100,000 ohms. The voltage on the input side of the subject will be ten volts. The voltage on the output side of the subject will be 5×10^{-5} amperes times 1×10^{5} ohms, or 5 volts.

Multivibrator Current Switching Circuit. This circuit consists of a Philbrick K2-W operational amplifier, a 6AL5 dual-diode, and associated capacitors and resistors.

The K2-W is wired as a typical multivibrator circuit with charge capacitors of 4mf, 0.4mf, 0.2mf, and 0.1mf, wired to a front panel switch. These capacitors cause the K2-W output to go positive and then negative at a rate of 0.1 cps, 1cps, 2cps or 4 cycles per second respectively, depending on the switch position. A positive or negative going external synchronizing signal may be imposed upon the multivibrator through a fitting connected to the input grid.

When the output of the multivibrator goes positive, plate 2 of the 6AL5 diode switch goes positive. This effectively causes a positive potential on the cathode of both diodes. Plate 1 of the 6AL5 has no current flow at this time because its associated cathode is positive. When the multivibrator swings negative, plate 2 of the diode becomes negative and thus cuts off. Cathodes 1 and 2 become negative due to the 300 volt voltage-divider network in this circuit. Current then flows from cathode 2 to plate 2, down through two 270,000 ohm resistors, and a 100,000 ohm balance potentiometer to ground. A negative potential is established at the junction of the 270,000 ohm diode plate resistor and the 270,000 ohm resistor which is connected to the balance

potentiometer. This negative potential counteracts the positive potential at the summing point of the constant current amplifier and produces an algebraic sum of equal but opposite voltage. The current flow through the subject is then 50ua in the reverse direction.

Differential Amplifiers. The two-stage differential amplifier consists of two Philbrick K2-W operational amplifiers, two Philbrick K2-P stabilizing amplifiers, and associated feedback and input resistors. The K2-P chopper amplifiers are requisite to obtaining the desired accuracy and resolution. Each amplifier has an amplification factor of one: $E_{out} = \frac{R_f}{R_{in}} \times E_{in}$. The ten volts present at the input side of the subject are inverted through the first of these amplifiers and introduced at one of the summing input resistors of the second amplifier. The voltage developed on the output side of the subject is fed to the other summing input resistor. The output of the second amplifier goes negative and positive as the current is reversed through the subject, and has a voltage value representing the algebraic difference between the two input voltages: $E_{out} = \frac{R_f}{R_{in}} \times E_1 + \frac{R_f}{R_{in}} \times E_2$.

The output voltage of the differential amplifiers has a range of -20 to +20 volts.

Absolute Value Circuit. The absolute value circuit keeps the output positive at all times. This circuit consists of two Philbrick K2-W operational amplifiers, two Philbrick K2-P stabilizing amplifiers, a 6AL5 dual-diode, a 1N38A diode, and associated resistors and capacitors.

is applied through a 250,000 ohm input resistor and the equal negative voltage from the first half of the absolute value circuit amplifier is applied through a 125,000 ohm input resistor. The resulting output from the second amplifier is a positive voltage equal to the positive output of the differential amplifier.

The plus or minus 20 volts output of the differential amplifier are applied to the 250,000 ohm input resistors of both amplifiers which make up the absolute value circuit. If the output is negative, the output of the operational amplifier with the 6AL5 switching diode in its feedback circuit goes positive to the same value. The cathode of the output diode is then positive and cuts off. The same positive output is also applied through a 50,000 ohm resistor to the plate of the feedback diode causing it to conduct, and thus reduce the summing point of the amplifier to zero volts. The 125,000 ohm input resistor to the second operational amplifier is kept at ground level by the 1N38A to ground. With a feedback resistor of 250,000 ohms in the second amplifier, it gives an output of some positive voltage equal to the negative input.

The resistance of the subject can be calculated by the formula $R = 50ua \times E_{out}$. This is only true if the final amplifier feedback resistance is 250,000 ohms. If this value is doubled, the voltage output must be divided by two; or if halved, multiplied by two, etc.

If the output of the differential amplifier goes positive, the output of the first amplifier goes negative and the cathode of the output diode goes negative. This negative voltage is applied to the 125,000 ohm input resistor of the second amplifier as the diode plate draws current. The negative voltage on the plate of the feedback diode cuts it off and only the 250,000 ohm feedback resistor is in the circuit. This causes an amplification of one through the first amplifier. The input to the second amplifier is then composed of two equal but opposite voltages. The positive output of the differential amplifier

[redacted] 129-5

(When Filled In) No. 3391

Cost Account 1125-1960-9902

Object Class

Date	Remarks and References	Obligations Incurred	Obligations Liquidated	Unliquidated Balance
30 JUN 1961	Mikulla Sub-128	2,505.33		2,505.33
11 JUL 1961	Inv #1		2,505.33	-

[redacted]

(When Filled In)

129-6

[redacted]

DATE: 22 June 1961

MEMORANDUM FOR : THE CONTROLLER

ATTENTION : Finance Division

SUBJECT : MKULTRA, Subproject 129

Under the authority granted in the memorandum dated 13 April 1953 from the DCI to the DD/A, and the extension of this authority in subsequent memoranda, Subproject 129 has been approved, and $2500.33 of the over-all Project MKULTRA funds have been obligated to cover the subproject's expenses and should be charged to cost center 1125-130-3X2.

[redacted]

I CERTIFY THAT FUNDS ARE AVAILABLE
OBLIGATION REFERENCE No: 2364
CHARGE TO ALLOTMENT No.

AUTHORIZING OFFICER

APPROVED FOR OBLIGATION OF FUNDS:
Original signed DD
[redacted]
Research Director

Date: 22 JUN 1961

Distribution:
Orig. & 2 - Addressee
1 - TSD/PASS
2 - TSD/RB

[redacted]

129-6A

[redacted]

(When Filled In)

CONFIDENTIAL FUNDS POSTING VOUCHER

VOUCHER NO. 7-12 | DATE 2-6 JUL 18 1961 | VOUCHER NO. 7-12

DESCRIPTION-ALL OTHER ACCOUNTS 13-33 / DESCRIPTION-ADVANCE ACCOUNTS 13-27	28-33 T/A NO. / P.O. NO. / 32-33 DIV.	34-39 STATION CODE / PROP. NO. / PROJECT NO.	40-42 EXPEND CODE / FY	43 FUNDS	45-46 PAY PER. LIQ. CODE	47-52 OBLIG. REF. NO. / ADVANCE ACCT. NO. / EMP. NO.	53 CA YR	54-57 GENERAL LEDGER ACCT. NO.	58-67 ALLOT. OR COST ACCT. NO.	62-67 CK. NO. / X REF. NO.	68-70 DUE DATE / OBJECT CLASS	71-80 AMOUNT DEBIT	71-80 AMOUNT CREDIT
Subproj 129 Inv?			8811			2381		601.0	25-1390-	3902	752	2565.33	
MKULTRA						108		1100		347			2565.33
											TOTALS		

EXPLANATION OF ENTRY

See attached

14492

DATE	PREPARED BY	DATE	REVIEWED BY	CERTIFIED FOR PAYMENT OR CREDIT: DATE	SIGNATURE OF CERTIFYING OFFICER
7/14/61	[redacted]				

FORM 10-59 606 USE PREVIOUS ED[redacted]

[redacted]

(10-49)

129-7

[redacted]
(When Filled In)

No. 863

Cost Account 1125-109-1402

Object Class _____

Date	Remarks and References	Obligations Incurred	Obligations Liquidated	Unliquidated Balance
27 OCT 1960	Mbulbia Sub 129 Auth	20,000.00		20,000.00
	Cancelled per [redacted] A	20,000.00		—

[redacted]
(When Filled In)

129-8

[redacted]

6 July 1961

MEMORANDUM FOR: Chief, Finance Division

VIA : TSD/Budget Officer

SUBJECT : MKULTRA, Subproject 129, Invoice No. 1, Allotment No. 1125-1390-3902

1. Invoice No. 1 is attached covering the above subproject. Payment should be made as follows:

Cashier's check in the amount of $2505.33 drawn on a [redacted] payable to the [redacted]

2. The check should be forwarded to Chief, TSD/Research Branch, through TSD/Budget Officer, no later than 17 July 1961.

3. This is a final invoice. However, since it is anticipated that additional funds will be obligated for this project, the files should not be closed.

[redacted]

Attached:
Invoice & Certifications

Distribution:
Orig & 2 - Addressee

CHECK [redacted] IN THE AMOUNT OF $2505.33
RECEIVED 19 JUL 1961

[redacted]

[redacted]

2332

[redacted] 129-9

24 October 1960

MEMORANDUM FOR: COMPTROLLER

ATTENTION : Finance Division

SUBJECT : MKULTRA, Subproject 129

Under the authority granted in the memorandum dated 13 April 1953 from the DCI to the DD/A, and the extension of this authority in subsequent memoranda, Subproject 129 has been approved and $20,000 of the over-all MKULTRA project funds has been obligated to cover the subproject's expenses. This obligation of funds should be charged to Allotment 1125-1009-1902.

[redacted] A

APPROVED FOR OBLIGATION OF FUNDS:

Original signed by [redacted] A

Research Director

Date: 24 Oct 1960

I CERTIFY THAT FUNDS ARE AVAILABLE 27 OCT 1960
OBLIGATION REFERENCE No. 813
CHARGE TO ALLOTMENT No. 1125-1009-1902
AUTHORIZING OFFICER

Distribution:
Orig & 2 - Addressee
1 - TSD/OC
1 - TSD/FASS

[redacted]

129-10

9 January 1961

MEMORANDUM FOR: Comptroller

ATTENTION : Finance Division

SUBJECT : Cancellation of MKULTRA Subproject-129

file

Memorandum dated 24 October 1960, to the Comptroller, approved MKULTRA Subproject 129 in the amount of $20,000. Due to a change in plans on the part of the principal investigator this project has been cancelled and the funds have been returned for use in other projects.

[redacted] A

APPROVED: [redacted] A

Research Director

Date: [redacted]

Distribution:
Orig. & 2 - Addressee
1 - TSD/FASS
2 - TSD/RB

129-11

RECEIPT

Receipt of the following check is hereby acknowledged:

Treasurer's Check No. 184192, dated July 18, 1961, drawn on the [redacted] E

[redacted] in the amount of $2,505.33, payable to the [redacted] B C

[redacted]

Date: 7-24-61

129-12

[redacted]

INVOICE

For Services $2505.33

[redacted]

CERTIFICATIONS

(1) It is hereby certified that this is Invoice 1 apply ng to sub-project No. 129 of [redacted], that performance is satisfactory, that services are being accomplished in accordance with mutual agreements, that a detailed account of the payments and receipts is on file in TSD/RB, that this bill is just and correct and that payment thereof has not yet been made.

[redacted]

Date: [redacted]

(2) It is hereby certified that this invoice applies to SubProject 129 of [redacted] which was duly approved, and that the project is being carried out in accordance with the memorandum of 13 April 1953 from the DCI to the DD/A, and the extension of this authority in subsequent memoranda.

[redacted]
Research Director

Date: [redacted]

[redacted]

129-13

[redacted]

6 July 1961

MEMORANDUM FOR: Chief, Finance Division

VIA : TSD/Budget Officer

SUBJECT : MKULTRA, Subproject 129, Invoice No. 1, Allotment No. 1125-1390-3902

1. Invoice No. 1 is attached covering the above subproject. Payment should be made as follows:

Cashier's check in the amount of $2505.33 drawn on a [redacted] payable to the [redacted]

E [redacted] B

2. The check should be forwarded to Chief, TSD/Research Branch, through TSD/Budget Officer, no later than 17 July 1961.

3. This is a final invoice. However, since it is anticipated that additional funds will be obligated for this project, the files should not be closed.

A

[redacted]

Attached:
Invoice & Certifications

Distribution:
Orig & 2 - Addressee
1 - TSD/FASS
2 - TSD/RB

[redacted]

129-14

[redacted]

DATE: 22 June 1961

MEMORANDUM FOR : THE COMPTROLLER

ATTENTION : Finance Division

SUBJECT : MKULTRA, Subproject 129

Under the authority granted in the memorandum dated 13 April 1953 from the DCI to the DD/A, and the extension of this authority in subsequent memoranda, Subproject 129 has been approved, and $2503.33 of the over-all Project MKULTRA funds have been obligated to cover the subproject's expenses and should be charged to cost center 1125-1330-3902.

[redacted]
Chief
TSD/Research Branch

APPROVED FOR OBLIGATION
OF FUNDS:

Research Director

Date:

Distribution:
Orig. & 2 - Addressee
1 - TSD/PASS
2 - TSD/RB

[redacted]

[redacted]

129-15

DRAFT [redacted]

22 June 1961

MEMORANDUM FOR: THE RECORD

SUBJECT : MKULTRA, Subproject 129

1. The purpose of this subproject is to support in part [redacted] research studies in the computer analysis of bioelectric response patterns. The work will be performed [redacted]

2. The attached proposal, as submitted to the [redacted] Research, covers the technical scope of the project. The study is designed to determine the single, relative and combined efficiency of nine separate indices of psychophysiological reaction in discriminating various kinds of stimuli to the source individual. The investigation has potential for fundamental aspects of the significance of bioelectric signals, as well as for applied measuring devices, such as the polygraph.

3. [redacted] has agreed to fund the original proposal in its entirety. Several additional items of equipment, neglected in the original budget, are crucial to carrying out the investigation. These items are listed in an attached letter. In return for financing of this equipment, [redacted] has agreed to keep us fully informed of his research progress and has indicated a willingness to modify his inquiries in any direction that would offer some benefit to the Agency.

4. The subproject will cover a period of one year and will cost $2505.33. Charges should be made against Allotment 1125-1390-3902.

[redacted]

129-154

5. Funding for this subproject will be handled as a grant from the [redacted] and accounting for the funds disbursed will follow the practices established for that organization.

6. Title to the equipment purchased shall remain with the [redacted] in lieu of overhead costs.

7. [redacted] has been cleared through TOP SECRET and is witting of true sponsorship.

[redacted]

APPROVED FOR OBLIGATION OF FUNDS:

[redacted]
Research Director

Date: [redacted]

Distribution:
Original Only

ATTACHMENTS;
Proposal & Budget

[redacted]

129-16

Deny in toto

129-17

DENY IN TOTO

129-18

June 9, 1961

Memorandum to: [redacted]

Subject: Recommendation for Funding - [redacted] $2,505.33

In a panicked telephone conversation on Friday, June 2, [redacted] explained that th[redacted]ad failed to honor indebtedness to [redacted] which incurred by [redacted] transfer and recently purchased equipment also went to [redacted]

The basic project will not bear the cost of previously expended funds, even though they are vital to the conduct of the experimental work. This, then, creates an opportunity for "buying into" [redacted] future work at an insignificant cost. He expresses a willingness to bend his inquiries in any direction feasible.

I recommend that we provide this emergency fund for [redacted] for future exploitation.

[redacted]

eb

Enc: 3

129-19

9 January 1961

MEMORANDUM FOR: Comptroller

ATTENTION : Finance Division

SUBJECT : Cancellation of MKULTRA Subproject-129

Memorandum dated 24 October 1960, to the Comptroller, approved MKULTRA Subproject 129 in the amount of $20,000. Due to a change in plans on the part of the principal investigator this project has been cancelled and the funds have been returned for use in other projects.

[redacted]
Chief
TSD/Research Branch

APPROVED:

Research Director

Date:

Distribution:
Orig. & 2 - Addressee
1 - TSD/FASS
2 - TSD/RB

[redacted]

129-20

TO: TSD/OC

This is an initiation of a new project.

1. Purpose of Project: To finance a part of [redacted] research on "Computer Analysis of Bioelectric Response Patterns." C

2. Project Monitor: [redacted] A

FROM: TSD/RB

Room [redacted] G

[redacted]

[redacted]

A 129-21

DRAFT/[redacted]
21 October 1960

MEMORANDUM FOR: THE RECORD

SUBJECT : MKULTRA, Subproject 129

1. This subproject is for the purpose of financing a part [redacted] attached proposal on "Computer Analysis of Bioelectric Response Patterns." The work will be performed at [redacted]

2. The attached proposal covers in adequate detail the technical scope of the project, which is designed to determine the single, relative and combined efficiency of nine separate indices of psychophysiological reaction in discriminating the significance of various kinds of stimuli to the source. The investigation has potential for fundamental aspects of the significance of bioelectric signals, as well as for applied measuring devices, such as the polygraph.

3. [redacted] is funding this proposal to the extent of $27,500, which includes everything but [redacted] We will fund the remaining $20,000, which represents this salary item. The project will cover a period of one year, starting 15 November 1960. Charges should be made against Allotment 1125-1009-1902.

[redacted]

129-21A

4. Although the [redacted] will provide a cutout function for passing the funds on to [redacted] the project has been evaluated and will be monitored solely by TSD/RB staff members. The funds will be given as a [redacted]ard will be accounted for by the normal procedures by which university grants are handled.

5. [redacted] has been cleared through TOP SECRET and is witting of true sponsorship.

[redacted]
Colel
TSD/Research Branch

APPROVED FOR OBLIGATION OF FUNDS:

[redacted]
Research Director

Date: 25 OCT 1950

Distribution:
Original only

ATTACHED:
Proposal & Budget

[redacted]

129-213

BUDGET

C

Salaries of [redacted] and One (1) assistant	$20,000
TOTAL	$20,000

5 dup

129-21c

Project Title: Computer analysis of bioelectric response patterns.

Principal Investigator: [redacted] C

Total estimated cost: $47,500 for 12 months

Preferred starting date: November 15, 1960

Duration: 12 months

Brief: Nine separate indices of psychophysiological reaction will be analyzed for their relative efficacy in discriminating stimuli of different arousal value to the source. Rapid and accurate evaluation of the psychophysiologic responses will be facilitated by computer analysis of these data. A variety of physiologic, motivational and expectational conditions of the source, context settings, and types of stimuli will be tested to determine their efficiency in differentiating between critical and neutral stimuli.

Requirement

The ordinary interviewer is handicapped by his inability to determine the kind of information carried by his informant. Once the interviewer can obtain a trustworthy catalog of information possessed by his source, his power and skill usually enable him to elicit it. If the source can remain unaware that an index of his private memories is available to the interviewer, it might prove an added advantage to the interviewer. This project proposes to devise the methods which will place listings of the sources' knowledge, with or without their awareness, into the hands of the interviewers.

Approach

The study seeks to differentiate the reactions of sources to critical and neutral stimuli. It is therefore necessary to equate the stimuli in all aspects except their significance and personal meaning to the subject. There are several ways of controlling the personal significance of stimuli: (a) by conditioning, (b) by embedding the stimuli in a conflictual context, and (c) by an independent measure of the inherent arousal value of various stimuli to the subject. By varying

the intensity and duration of the stimuli, they can be presented both below and above the subject's threshold of awareness.

A number of different reactions by the subject to critical and neutral stimuli will be recorded. Resting muscle action potential voltages from the frontalis muscles will be amplified by two cascaded, low-level, differential A.C. preamplifiers. This signal is then rectified and integrated by a constant-voltage integrator which is sampled by the sampling switch and reset by a signal from the A-D converter, following the completed conversion of the voltage, at regular 0.1 second intervals.

A cardiotachometer will convert the interval between ECG R spikes to an analog voltage, representative of intersystole time, which will be sampled every 0.25 seconds.

Finger pulse amplitude will be derived from a piezoelectric transducer, amplified by a differential A.C. amplifier, held at its maximum during the interpulse period by a peak follower, sampled at intervals of 0.25 seconds, and reset by a signal from the negative phase of the ECG R spike which precedes the next pulse.

Changes in chest circumference will activate a single-turn, linear, precision potentiometer, which as part of a bridge circuit will provide a rough index of respiratory excursions. This measure will be correlated with tidal and minute volume. The amplified D.C. voltage will be sampled every 0.1 second to provide a full description of the respiration cycles.

With the subject in the feedback loop of an amplifier and a constant 100 uamperes across him, skin resistance changes of one part in 1,000 will be picked up by a differential D.C. amplifier, and sampled at 0.1 second intervals. Non-determinable measurement errors, due to the polarization of the electrodes, will be eliminated by reversing the polarity of the constant current supply every 0.5 second.

Skin temperature will be measured with a thermistor, forming part of a D.C. bridge. This slowly changing signal is sampled every 0.25 second.

Changes in body-weight shift will be picked up by a pressure transducer, amplified, rectified, integrated and reset at 0.25 second intervals.

Reaction time will be recorded to the nearest millisecond by a chronometer with four binary-coded decimal decades. This information will be transferred directly to the tape without going through the A-D converter.

The other analog channels will be converted into digital information and recorded on digital magnetic tape for analysis by digital computer. The physiologic reactions associated with each stimulus constitute a block of about 2,000 thirty-six bit words, which will be read into the computer one block at a time. The computer will unpack these data by sorting the prestimulus and postimulus reactions for each physiologic variable. Required transformations of scores will be made. It will then compute normalized pre-postimulus differences for each channel, taking the regression of the postimulus reactions on the prestimulus responses into account. These differences form the basis for a statistical analysis of any particular experiment. The advantages of such analysis will probably be reflected in saving of time, increased accuracy, greater flexibility, and more detailed examination of a wider range of physiologic response variables and experimental conditions.

Background History

The proposed research is a continuation of work done under B contract [redacted]. Detailed plans for the design and construction of the equipment required to carry out this study have been made. Much thought has gone into devising the best method for recording and analyzing the data to be collected. An experiment is now underway to study the response of subjects with inherently different perceptual orientations, under several experimentally imposed physiologic conditions, to critical and neutral words of the type useful to the proposed study. The experience derived from this experiment is directly applicable to and provides the foundation for the proposed continuation.

129-21F

Statement of Work

1. General

This project will seek to identify symbols of special significance to human sources by recording and analyzing a variety of involuntary responses of the sources. In order to have accurate results on each source available in the shortest possible time, computer processing will be attempted for data reduction and analysis. It is expected that this analysis will provide a basis for the differential weighting of the various response channels, which will maximize the differentiation between critical and neutral stimuli.

2. Specific

a. Involuntary responses

The source reactions which will be studied are:

Muscle action potential voltage
Intersystole time
Finger pulse amplitude
Respiration cycle duration and amplitude
Skin resistance
Skin temperature
Body-weight shifts
Reaction time

b. Recording of responses

A continuous sampling of responses will be recorded immediately and directly on digital magnetic tape in a format suitable for digital computer processing. To permit the uninterrupted recording of an experimental session on a single reel of tape, it is desirable to reduce the sampling rate through analog editing of the several data channels prior to the analog to digital conversion of the information. The source's reactions will be monitored on an oscillograph while they are being recorded on tape.

c. Data conversion

Conversion of the data into digital form will be accomplished by electronic equipment consisting of a sampling switch, an analog to digital converter, a

format control, a tape control, digital write electronics, and a digital tape recorder.

d. Data analysis

A digital computer program will be written to accomplish the statistical analysis of the experimental runs.

e. Nature of stimuli

Symbols matched in all respects except their personal significance to the subject will be employed. The intensity and duration of the stimuli will cover a range well below and above the subject's threshold of awareness, using the ascending method of limits. The inherent personal significance of the symbols will be ascertained, or such significance will be inculcated experimentally.

f. Experimental conditions

Conditions of requiring a verbal, motoric, or no response from the subject will be investigated. The freedom which the subject exercises over his voluntary responses, and the effect on producing response conflict are also of interest. Feedback of the success of the experimenter's discrimination to the subject deserves careful study. In addition, the context of the experimental setting and the subject's involvement in it are very important.

g. Subject variables

Autonomically stabile subjects are likely to react very differently than autonomically labile subjects. Also, alert, perceptually sensitive subjects can be expected to behave rather differently than repressive, insensitive subjects. There may be further age, sex, background and experience differences. The physiologic state of the organism to the extent to which it influences CNS activity is another factor to be considered.

b. Discriminative potency

The value of the several physiologic variables as discriminators between critical and neutral stimuli under various experimental conditions will be assessed, with a view toward attaching appropriate beta-weights to each variable. The cross-validation of these multiple correlations is probably beyond the scope of the present contract.

Equipment

Equipment on hand at the present time consists of a six-channel oscillograph with drive amplifiers, an analog to digital converter (Epsco Datrac), a cardiotachometer, and a number of electrodes, amplifiers, integrators and power supplies for the various analog data channels.

Equipment to be purchased includes a tape transport with digital write electronics, component parts for the analog to digital conversion system, a shielded enclosure, and some additional transducers, amplifiers and integrators for other analog channels.

Other Information

The organization is able to finance contracts in the amount of $50,000.

The organization is not prepared to participate in this project.

This research is unclassified.

A proposal has not been submitted to any other agency for support.

The bidder represents: (a) that he has not employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract and (b) that he has not paid or agreed to pay to any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating thereto as requested by the contracting officer.

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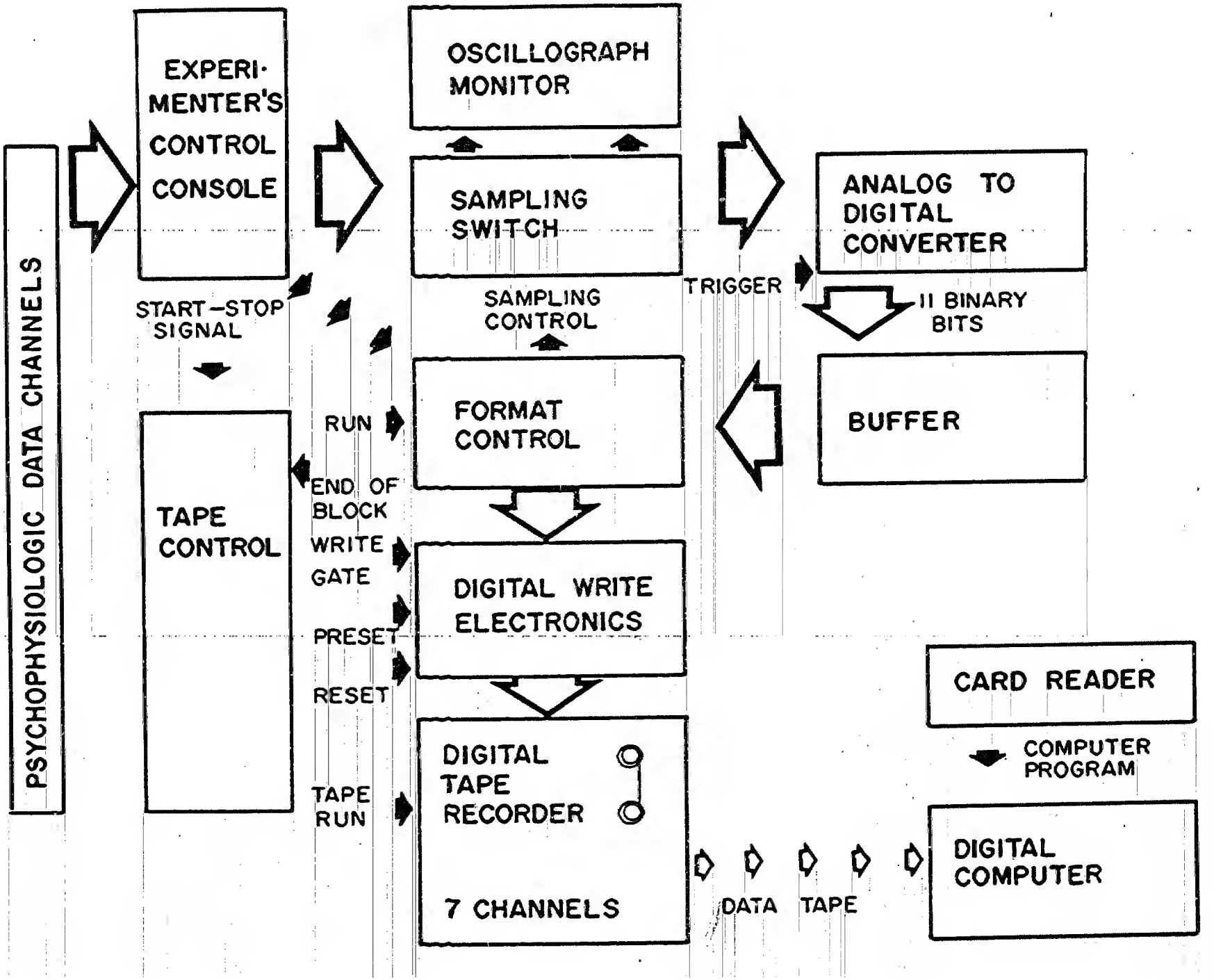
PSYCHOPHYSIOLOGIC DATA CHANNELS
EXPERI-MENTER'S CONTROL CONSOLE
OSCILLOGRAPH MONITOR
SAMPLING SWITCH
ANALOG TO DIGITAL CONVERTER
START-STOP SIGNAL
SAMPLING CONTROL
TRIGGER
11 BINARY BITS
TAPE CONTROL
RUN
FORMAT CONTROL
BUFFER
END OF BLOCK
WRITE GATE
DIGITAL WRITE ELECTRONICS
PRESET
RESET
CARD READER
COMPUTER PROGRAM
DIGITAL TAPE RECORDER
TAPE RUN
7 CHANNELS
DATA TAPE
DIGITAL COMPUTER

Fig. 1. Data Flow Chart. The open arrows indicate the progress of psychophysiologic information through the system. The solid arrows show internal control signals of the system.

129-21N.

[redacted]

[redacted]

[redacted]

129-22

24 October 1960

MEMORANDUM FOR: COMPTROLLER

ATTENTION : Finance Division

SUBJECT : MKULTRA, Subproject 129

Under the authority granted in the memorandum dated 13 April 1953 from the DCI to the DD/A, and the extension of this authority in subsequent memoranda, Subproject 129 has been approved and $20,000 of the over-all MKULTRA project funds has been obligated to cover the subproject's expenses. This obligation of funds should be charged to Allotment 1125-1009-1902.

[redacted]
Chief
TSD/Research Branch

APPROVED FOR OBLIGATION OF FUNDS:

[redacted]
Research Director

Date: [redacted]

Distribution:
Orig & 2 - Addressee
1 - TSD/CC
1 - TSD/FASS
2 - TSD/RB

[redacted]

129-23

19 October 1960

TSD/RB

Date Recd		Date Fwd
19 Oct	[redacted]	19 Oct
19 Oct	[redacted]	19 Oct
19 Oct	[redacted]	19 Oct
1	[redacted]	
24 Oct	[redacted]	20 Oct
	[redacted]	
	[redacted]	
20 Oct	[redacted]	20 Oct

Remarks Meeting 25 Oct 1400

[redacted] responsible officer.

ILE

129-24

21 October 1960

MEMORANDUM FOR THE RECORD

SUBJECT: Research Meeting on the [redacted]

1. [redacted] proposal on Computer Analysis of Biolectric Response Patterns was considered at a meeting attended by [redacted] had previously considered and approved it. [redacted] was away on a training mission.

2. The proposal was approved by the group after some discussion on the tendency for research whose data was to be feed into a computer to be fashioned. It was agreed that this proposal would have considerable pertinence and promise.

3. It was explained in the course of discussion that [redacted] and his assistant will move from [redacted] after the nominal approval of our grant by [redacted]

SIDNEY GOTTLIEB

SG: [redacted]

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